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REFERENCE: B-4982

PROJECT: 40159

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STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS
 GEOTECHNICAL ENGINEERING UNIT

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY IREDELL
 SITE DESCRIPTION BRIDGE NO. 38 ON US 2/NC 115
(SHELTON RD.) OVER THIRD CREEK

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4982	1	27

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

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 2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PERSONNEL

J.K. STICKNEY

C.L. SMITH

M.R. MOORE

INVESTIGATED BY J.K. STICKNEY

DRAWN BY T.T. WALKER

CHECKED BY J.E. BEVERLY

SUBMITTED BY K.B. MILLER

DATE NOVEMBER 2016



DocuSigned by:

11/16/2016

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DATE

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (ASTM D1586).

Table with columns for GENERAL CLASS., GRANULAR MATERIALS, SILT-CLAY MATERIALS, and ORGANIC MATERIALS. Includes subgroups A-1 through A-7 and symbols for various soil types.

PI OF A-7-5 SUBGROUP IS ≤ LL - 30; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

Table mapping PRIMARY SOIL TYPE to COMPACTNESS OR CONSISTENCY, RANGE OF STANDARD PENETRATION RESISTANCE, and RANGE OF UNCONFINED COMPRESSIVE STRENGTH.

TEXTURE OR GRAIN SIZE

Table showing U.S. STD. SIEVE SIZE OPENING (MM) for BOULDER, COBBLE, GRAVEL, COARSE SAND, FINE SAND, SILT, and CLAY.

SOIL MOISTURE - CORRELATION OF TERMS

Table correlating SOIL MOISTURE SCALE (ATTERBERG LIMITS) with FIELD MOISTURE DESCRIPTION and GUIDE FOR FIELD MOISTURE DESCRIPTION.

PLASTICITY

Table showing PLASTICITY INDEX (PI) and DRY STRENGTH for NON PLASTIC, SLIGHTLY PLASTIC, MODERATELY PLASTIC, and HIGHLY PLASTIC soils.

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.

ANGULARITY OF GRAINS: THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

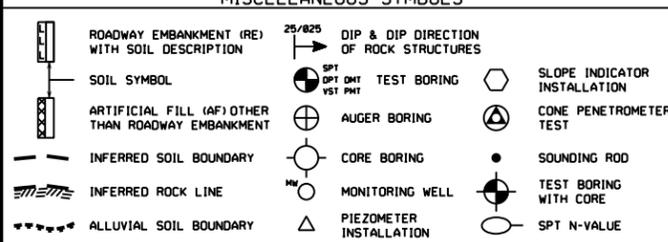
MINERALOGICAL COMPOSITION: MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY: SLIGHTLY COMPRESSIBLE, MODERATELY COMPRESSIBLE, HIGHLY COMPRESSIBLE. Includes LL values.

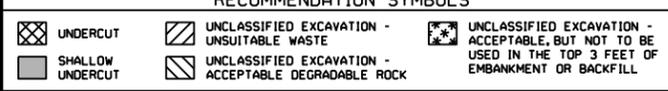
Table for PERCENTAGE OF MATERIAL showing ORGANIC MATERIAL, GRANULAR SOILS, SILT-CLAY SOILS, and OTHER MATERIAL.

GROUND WATER: Symbols for WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING, STATIC WATER LEVEL AFTER 24 HOURS, PERCHED WATER, SATURATED ZONE, SPRING OR SEEP.

MISCELLANEOUS SYMBOLS



RECOMMENDATION SYMBOLS



ABBREVIATIONS

- AR - AUGER REFUSAL, BT - BORING TERMINATED, CL - CLAY, CPT - CONE PENETRATION TEST, CSE - COARSE, DMT - DILATOMETER TEST, DPT - DYNAMIC PENETRATION TEST, e - VOID RATIO, F - FINE, FOSS - FOSSILIFEROUS, FRAC - FRACTURED, FRAGMENTS, w - MOISTURE CONTENT, HL - HIGHLY, MED. - MEDIUM, MICA - MICACEOUS, MOD. - MODERATELY, NP - NON PLASTIC, ORG. - ORGANIC, PMT - PRESSUREMETER TEST, SAP. - SAPROLITIC, SD - SAND, SANDY, SL - SILT, SILTY, SLL - SLIGHTLY, TCR - TRICONE REFUSAL, w - MOISTURE CONTENT, V - VERY, VST - VANE SHEAR TEST, WEA. - WEATHERED, % - UNIT WEIGHT, % - DRY UNIT WEIGHT, SAMPLE ABBREVIATIONS: S - BULK, SS - SPLIT SPOON, ST - SHELBY TUBE, RS - ROCK, RT - RECOMPACTED TRIAXIAL, CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

- DRILL UNITS: CME-45C, CME-55, CME-550, VANE SHEAR TEST, PORTABLE HOIST, CME-550X. ADVANCING TOOLS: CLAY BITS, 6" CONTINUOUS FLIGHT AUGER, 8" HOLLOW AUGERS, HARD FACED FINGER BITS, TUNG-CARBIDE INSERTS, CASING w/ ADVANCER, TRICONE STEEL TEETH, TRICONE TUNG-CARB., CORE BIT. HAMMER TYPE: AUTOMATIC, MANUAL. CORE SIZE: B, H, N-X. HAND TOOLS: POST HOLE DIGGER, HAND AUGER, SOUNDING ROD, VANE SHEAR TEST.

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL.

WEATHERED ROCK (WR): NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.

CRYSTALLINE ROCK (CR): FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED.

NON-CRYSTALLINE ROCK (NCR): FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED.

COASTAL PLAIN SEDIMENTARY ROCK (CPS): COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL.

WEATHERING

FRESH: ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. VERY SLIGHT (V SLI.): ROCK GENERALLY FRESH, JOINTS STAINED. SLIGHT (SLI.): ROCK GENERALLY FRESH, JOINTS STAINED. MODERATE (MOD.): SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION. MODERATELY SEVERE (MOD. SEV.): ALL ROCK EXCEPT QUARTZ DISCOLORED. SEVERE (SEV.): ALL ROCK EXCEPT QUARTZ DISCOLORED. VERY SEVERE (V SEV.): ALL ROCK EXCEPT QUARTZ DISCOLORED. COMPLETE: ROCK REDUCED TO SOIL.

ROCK HARDNESS

VERY HARD: CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. HARD: CAN BE SCRATCHED BY KNIFE OR PICK. MODERATELY HARD: CAN BE SCRATCHED BY KNIFE OR PICK. MEDIUM HARD: CAN BE GROOVED OR GOUGED. SOFT: CAN BE GROOVED OR GOUGED. VERY SOFT: CAN BE CARVED WITH KNIFE.

FRACTURE SPACING

Table for FRACTURE SPACING and BEDDING with columns for TERM, SPACING, and THICKNESS.

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. FRIABLE: RUBBING WITH FINGER FREES NUMEROUS GRAINS. MODERATELY INDURATED: GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE. INDURATED: GRAINS ARE DIFFICULT TO SEPARATE. EXTREMELY INDURATED: SHARP HAMMER BLOWS REQUIRED.

TERMS AND DEFINITIONS

- ALLUVIUM (ALLUV.): SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED. DIKE - A TABULAR BODY OF IGNEOUS ROCK. DIP - THE ANGLE AT WHICH A STRATUM IS INCLINED. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE. FAULT - A FRACTURE OR FRACTURE ZONE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE. FLOOD PLAIN (FP) - LAND BORDERING A STREAM. FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT. JOINT - FRACTURE IN ROCK. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION. LENS - A BODY OF SOIL OR ROCK. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS. PERCHED WATER - WATER MAINTAINED ABOVE NORMAL GROUND WATER LEVEL. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE. ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK. SLICKENSIDE - POLISHED AND STRIATED SURFACE. STANDARD PENETRATION TEST (SPT) - NUMBER OF BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED. STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY. TOPSOIL (TS) - SURFACE SOILS. BENCH MARK: BM-2; R/R SPIKE SET IN BASE OF 24" OAK TREE ON SOUTHEAST SIDE OF THIRD CREEK, STATION 22+00.4 -L-, 206.7 RT. ELEVATION: 782.82 FEET.

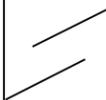
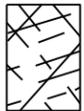
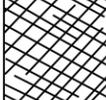
NOTES:

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS
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SUBSURFACE INVESTIGATION

SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES
 FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

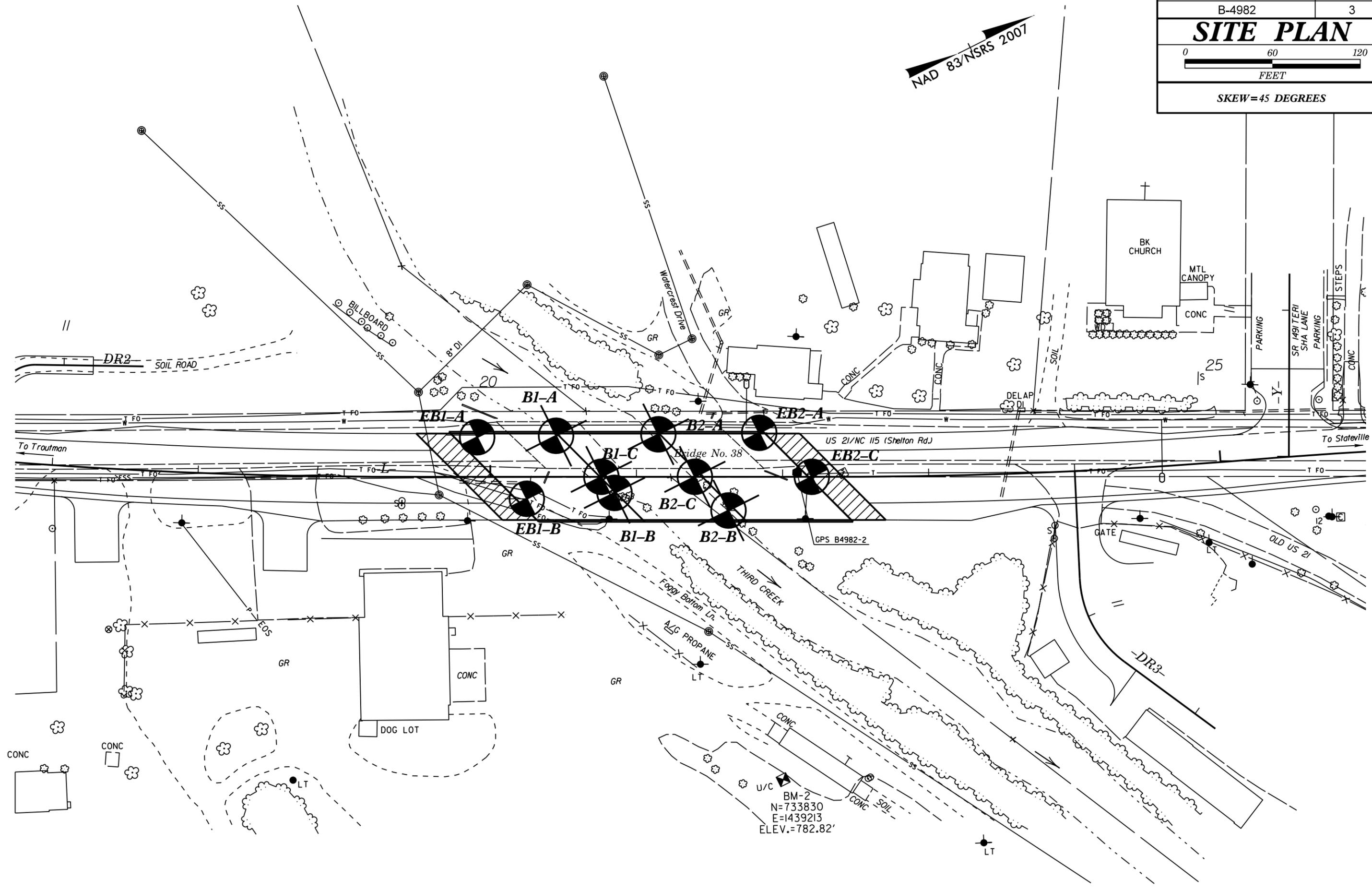
AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

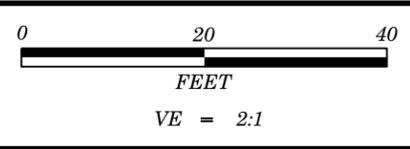
GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)		SURFACE CONDITIONS					GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)		SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)							
From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.		VERY GOOD Very rough, fresh unweathered surfaces	GOOD Rough, slightly weathered, iron stained surfaces	FAIR Smooth, moderately weathered and altered surfaces	POOR Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments	VERY POOR Slickensided, highly weathered surfaces with soft clay coatings or fillings	VERY GOOD - Very Rough, fresh unweathered surfaces	GOOD - Rough, slightly weathered surfaces	FAIR - Smooth, moderately weathered and altered surfaces	POOR - Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments	VERY POOR - Very smooth, slickensided or highly weathered surfaces with soft clay coatings or fillings					
STRUCTURE		DECREASING SURFACE QUALITY →					COMPOSITION AND STRUCTURE									
	INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities	90			N/A	N/A		A. Thick bedded, very blocky sandstone. The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.	70							
	BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets	80	70					B. Sandstone with thin inter-layers of siltstone	60							
	VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets		60	50				C. Sandstone and siltstone in similar amounts		50						
	BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity			40				D. Siltstone or silty shale with sandstone layers		40						
	DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces				30			E. Weak siltstone or clayey shale with sandstone layers		30						
	LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes					20		F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure		20						
						10		G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers		10						
		N/A	N/A					H. Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.								

→ Means deformation after tectonic disturbance

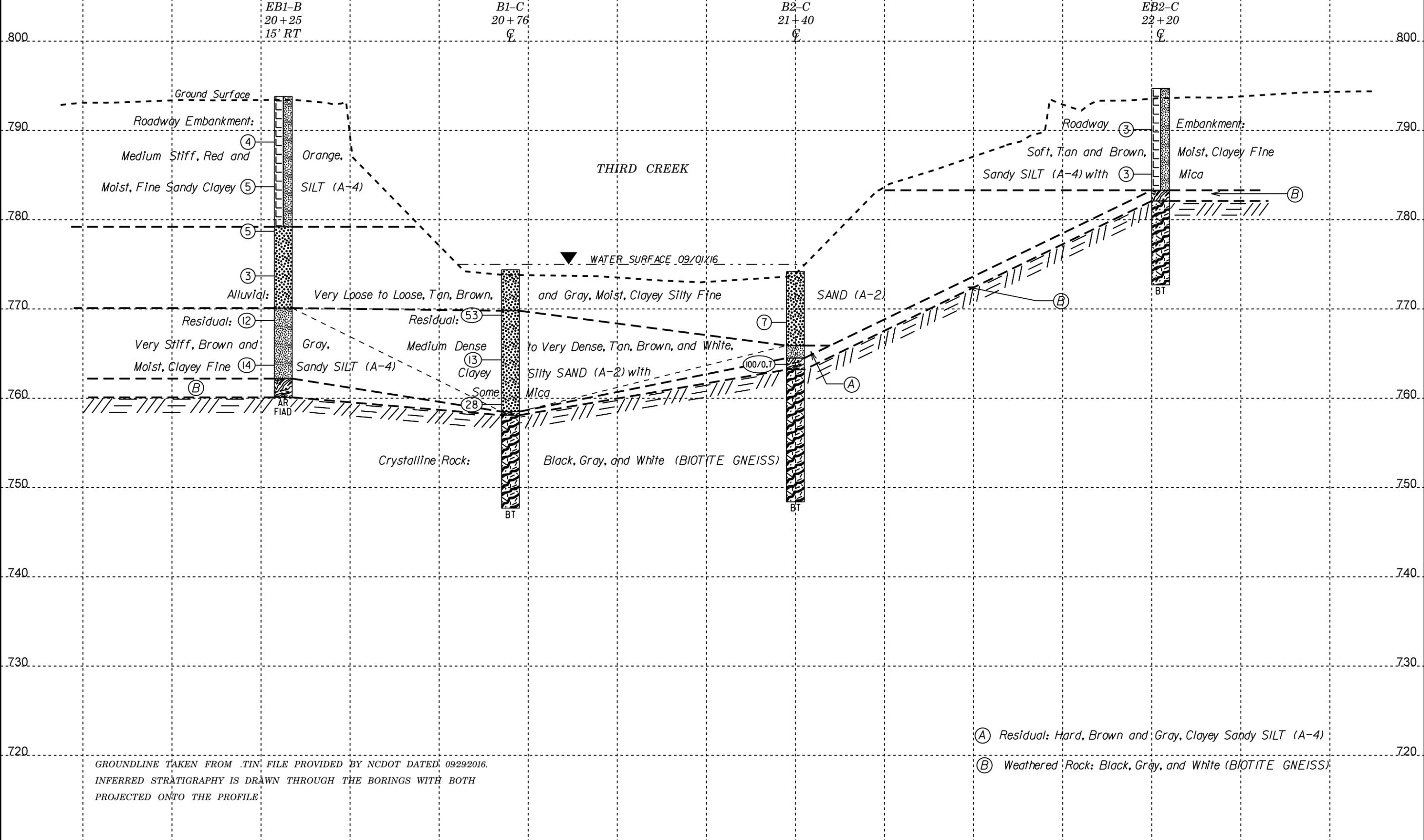
PROJECT REFERENCE NO.	SHEET NO.
B-4982	3
SITE PLAN	
 0 60 120 FEET	
SKEW=45 DEGREES	

NAD 83/NSRS 2007





PROJECT REFERENCE NO.	SHEET NO.
B-4982	4
PROFILE BORINGS PROJECTED ALONG -L-	



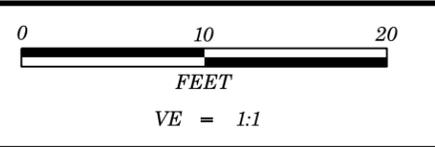
GROUNDLINE TAKEN FROM .TIN. FILE PROVIDED BY NCDOT DATED 09/29/2016.
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
 PROJECTED ONTO THE PROFILE

- (A) Residual: Hard, Brown and Gray, Clayey Sandy SILT (A-4)
- (B) Weathered Rock: Black, Gray, and White (BIOTITE GNEISS)

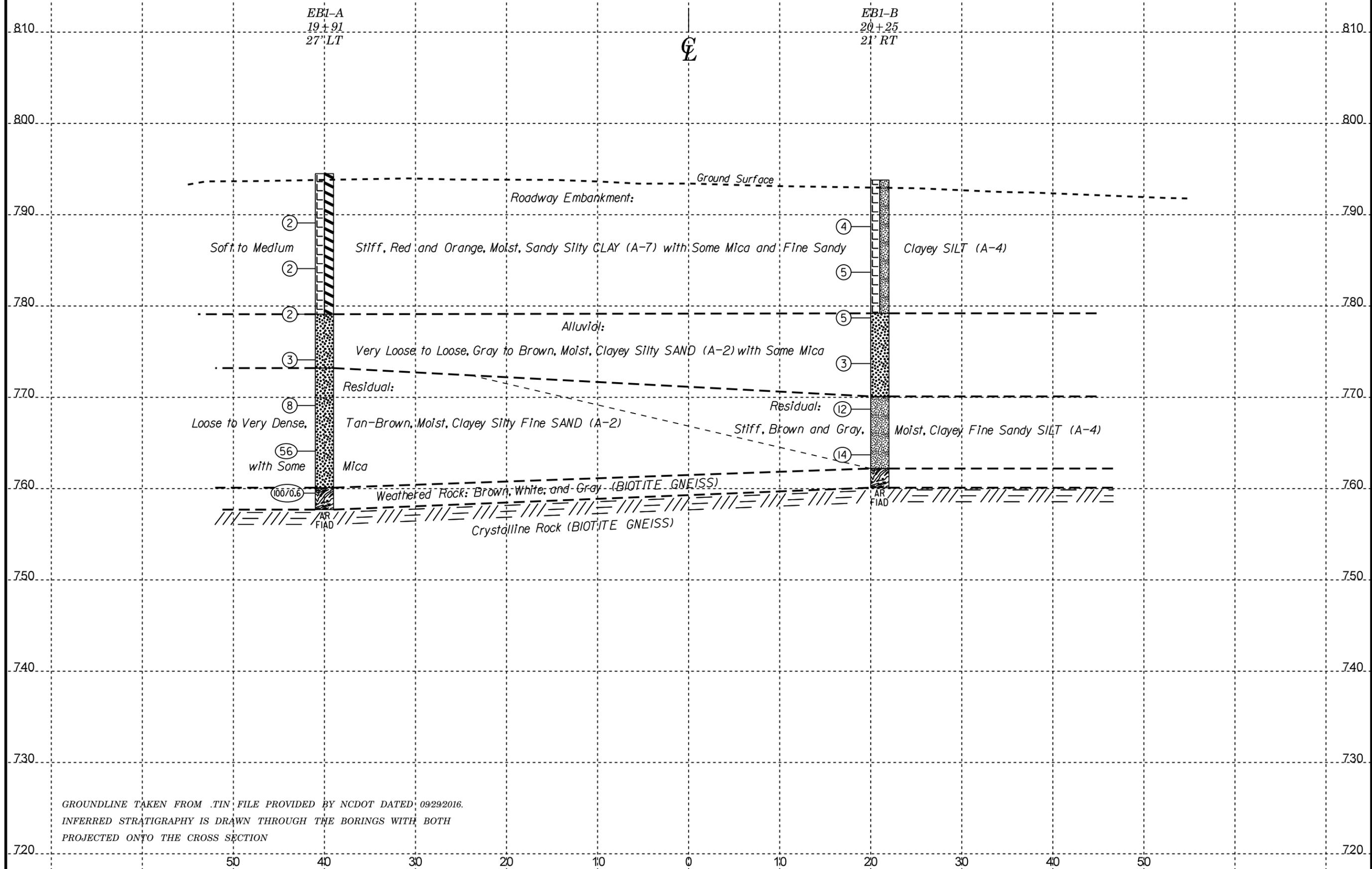
20+00

21+00

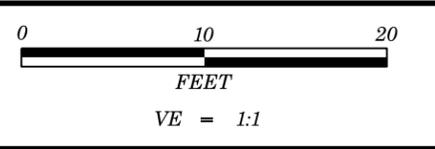
22+00



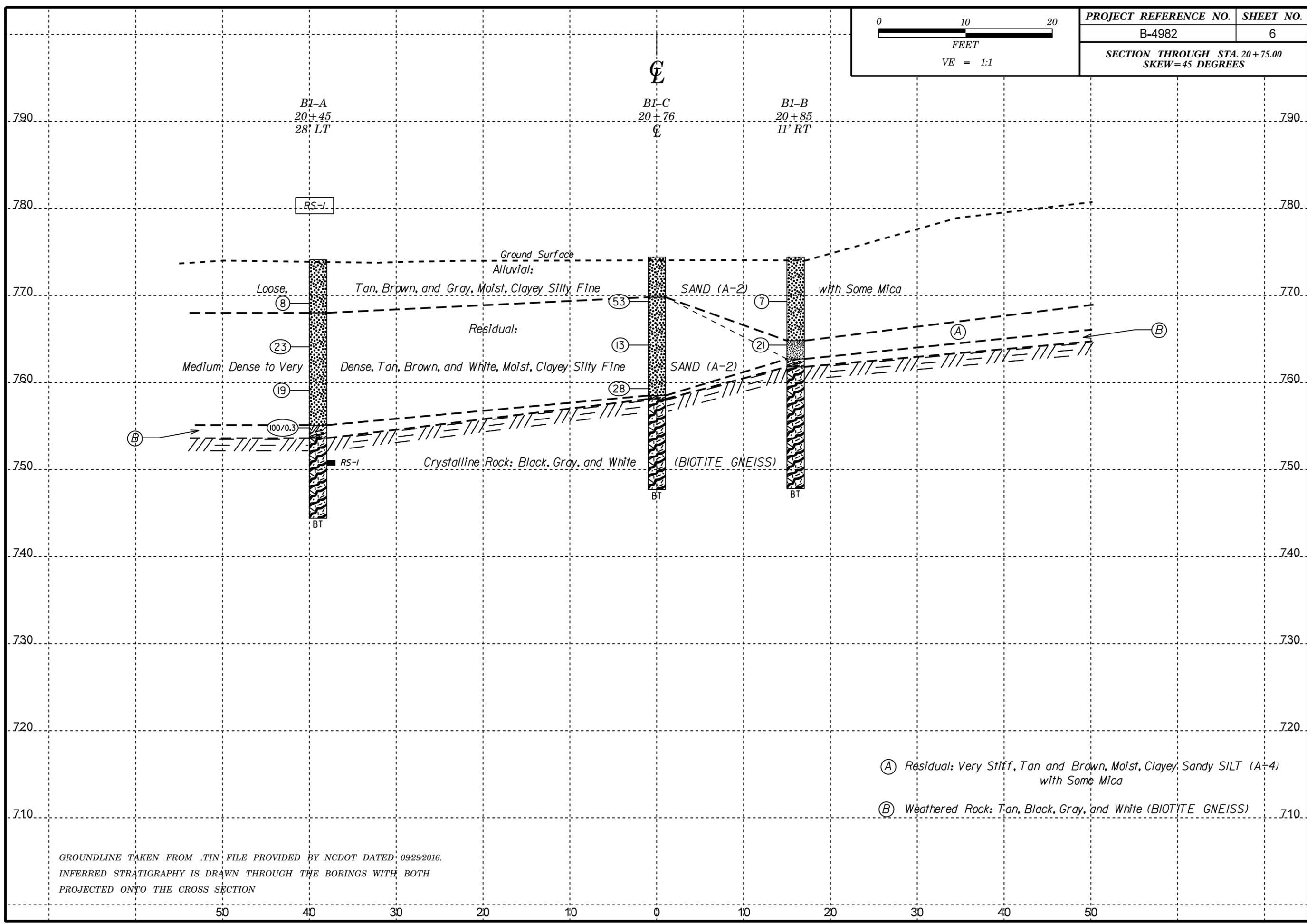
PROJECT REFERENCE NO.	SHEET NO.
B-4982	5
SECTION THROUGH STA. 20+02.40 SKEW=45 DEGREES	



GROUNDLINE TAKEN FROM TIN FILE PROVIDED BY NCDOT DATED 09/29/2016.
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
 PROJECTED ONTO THE CROSS SECTION

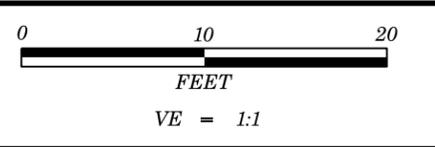


PROJECT REFERENCE NO.	SHEET NO.
B-4982	6
SECTION THROUGH STA. 20+75.00 SKEW=45 DEGREES	

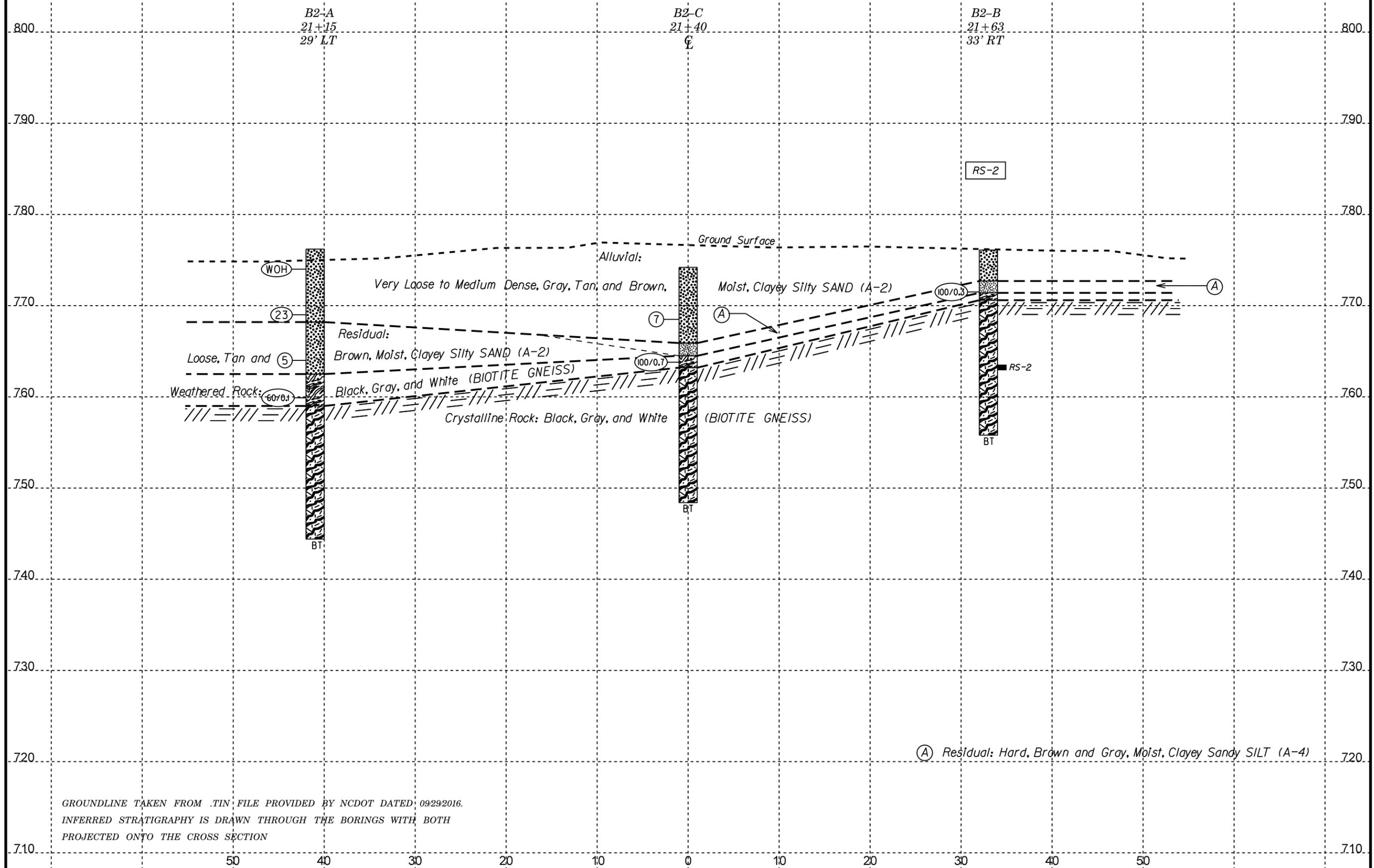


GROUNDLINE TAKEN FROM .TIN FILE PROVIDED BY NCDOT DATED 09/29/2016.
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
 PROJECTED ONTO THE CROSS SECTION

- (A) Residual: Very Stiff, Tan and Brown, Moist, Clayey, Sandy SILT (A-4) with Some Mica
- (B) Weathered Rock: Tan, Black, Gray, and White (BIOTITE GNEISS)

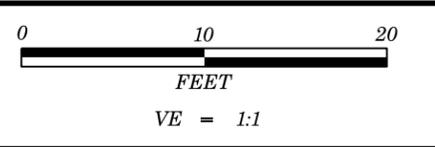


PROJECT REFERENCE NO.	SHEET NO.
B-4982	7
SECTION THROUGH STA. 21+45.00 SKEW=45 DEGREES	

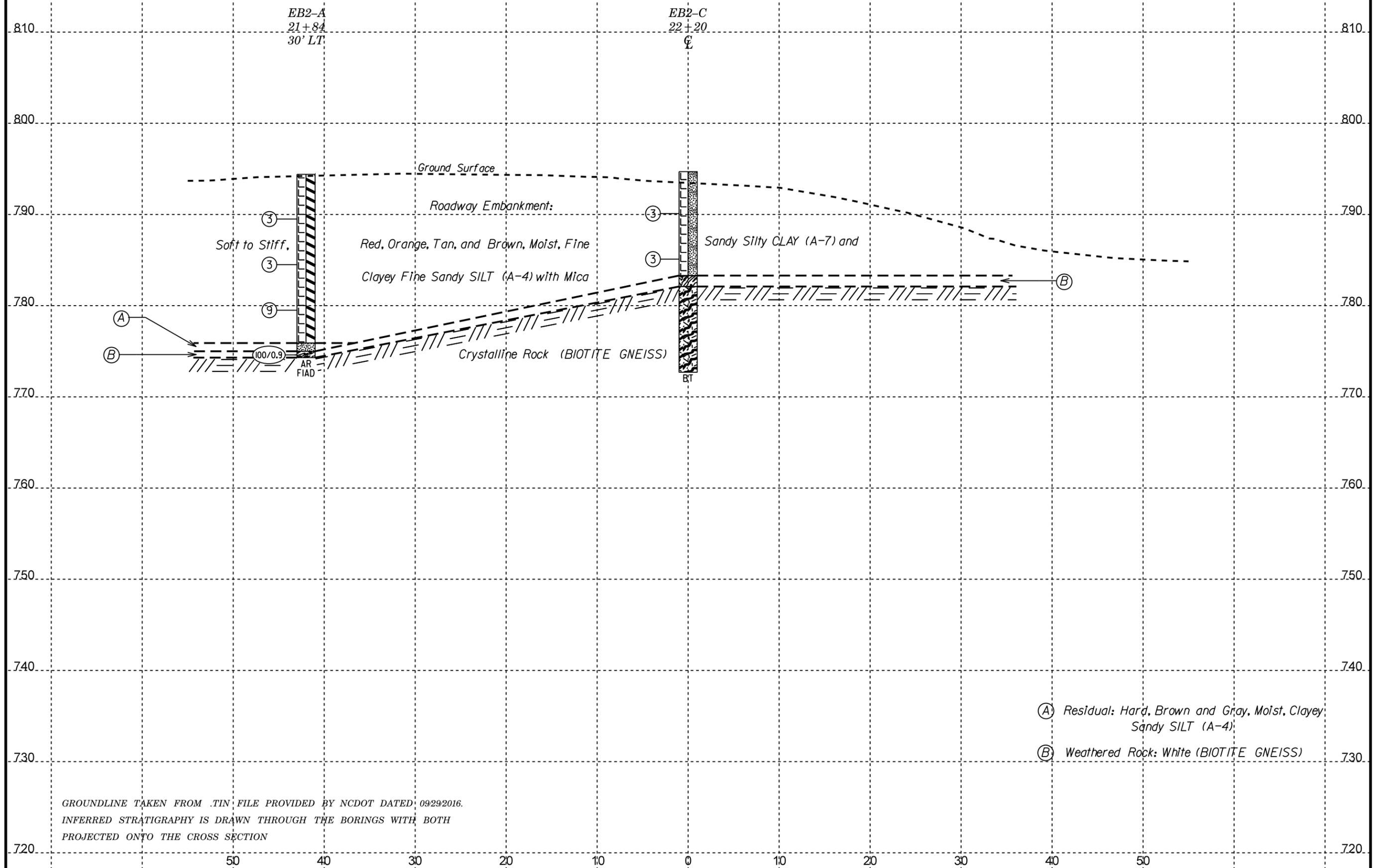


GROUNDLINE TAKEN FROM .TIN FILE PROVIDED BY NCDOT DATED 09/29/2016.
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
 PROJECTED ONTO THE CROSS SECTION

(A) Residual: Hard, Brown and Gray, Moist, Clayey Sandy SILT (A-4)



PROJECT REFERENCE NO.	SHEET NO.
B-4982	8
SECTION THROUGH STA. 22+17.57 SKEW=45 DEGREES	



GEOTECHNICAL BORING REPORT

BORE LOG

WBS 40159.1.1		TIP B-4982		COUNTY IREDELL		GEOLOGIST Stickney, J. K.										
SITE DESCRIPTION Bridge No. 38 on US 21/NC 115 (Shelton Rd.) over Third Creek							GROUND WTR (ft)									
BORING NO. EB1-A		STATION 19+91		OFFSET 27 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 794.5 ft		TOTAL DEPTH 36.8 ft		NORTHING 733,748		EASTING 1,438,910										
DRILL RIG/HAMMER EFF./DATE HFC0072 CME-550X 85% 05/20/2016			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic										
DRILLER Smith, C. L.		START DATE 08/18/16		COMP. DATE 08/18/16		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
795														794.5	0.0	GROUND SURFACE
																ROADWAY EMBANKMENT Red-Orange, Sandy Silty CLAY (A-7) with Some Mica
790	790.1	4.4	1	1	1	2							M			
785	785.1	9.4	2	1	1	2							M			
780	780.1	14.4	1	1	1	2							M	779.1	15.4	ALLUVIAL Gray, Clayey Silty SAND (A-2) with Some Mica
775	775.1	19.4	2	1	2	2							M	773.2	21.3	RESIDUAL Tan-Brown, Clayey Silty Fine SAND (A-2) with Some Mica
770	770.1	24.4	2	4	4	3							M			
765	765.1	29.4	11	25	31	56							M			
760	760.1	34.4	70	30/0.1		100/0.6							M	760.1	34.4	WEATHERED ROCK Brown, White, and Gray (BIOTITE GNEISS)
														757.7	36.8	Boring Terminated by Auger Refusal at Elevation 757.7 ft on Crystalline Rock (BIOTITE GNEISS)

WBS 40159.1.1		TIP B-4982		COUNTY IREDELL		GEOLOGIST Stickney, J. K.										
SITE DESCRIPTION Bridge No. 38 on US 21/NC 115 (Shelton Rd.) over Third Creek							GROUND WTR (ft)									
BORING NO. EB1-B		STATION 20+25		OFFSET 15 ft RT		ALIGNMENT -L-										
COLLAR ELEV. 793.8 ft		TOTAL DEPTH 33.7 ft		NORTHING 733,759		EASTING 1,438,963										
DRILL RIG/HAMMER EFF./DATE HFC0072 CME-550X 85% 05/20/2016			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic										
DRILLER Smith, C. L.		START DATE 08/23/16		COMP. DATE 08/23/16		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
795														793.8	0.0	GROUND SURFACE
																ROADWAY EMBANKMENT Red and Orange, Fine Sandy Clayey SILT (A-4)
790	789.7	4.1	2	2	2	4							M			
785	784.7	9.1	2	2	3	5							M			
780	779.7	14.1	2	3	2	5							M	779.2	14.6	ALLUVIAL Brown, Clayey Silty SAND (A-2) with Some Mica
775	774.7	19.1	1	1	2	3							M			
770	769.7	24.1	4	7	5	12							M	770.1	23.7	RESIDUAL Brown and Gray, Clayey Fine Sandy SILT (A-4)
765	764.7	29.1	3	8	6	14							M	762.2	31.6	WEATHERED ROCK Brown and White (BIOTITE GNEISS)
														760.1	33.7	Boring Terminated by Auger Refusal at Elevation 760.1 ft on Crystalline Rock (BIOTITE GNEISS)

NCDOT BORE DOUBLE B4982_GEO_BH_BRDG0038.GPJ NC_DOT.GDT 11/7/16

GEOTECHNICAL BORING REPORT BORE LOG

GEOTECHNICAL BORING REPORT CORE LOG

WBS 40159.1.1		TIP B-4982		COUNTY IREDELL		GEOLOGIST Stickney, J. K.										
SITE DESCRIPTION Bridge No. 38 on US 21/NC 115 (Shelton Rd.) over Third Creek							GROUND WTR (ft)									
BORING NO. B1-A		STATION 20+45		OFFSET 28 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 774.1 ft		TOTAL DEPTH 29.7 ft		NORTHING 733,797		EASTING 1,438,933										
DRILL RIG/HAMMER EFF./DATE HFC0072 CME-550X 85% 05/20/2016				DRILL METHOD NW Casing W/SPT & Core		HAMMER TYPE Automatic										
DRILLER Smith, C. L.		START DATE 08/18/16		COMP. DATE 08/18/16		SURFACE WATER DEPTH 0.5ft										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
775														774.1	0.0	GROUND SURFACE
770	770.1	4.0	1	4	4							M	ALLUVIAL Brown and Gray, Clayey Silty Fine SAND (A-2) with Some Mica	6.1	768.0	
765	765.1	9.0	10	11	12							M	RESIDUAL Tan and Brown, Clayey Silty Fine SAND (A-2)			
760	760.1	14.0	5	8	11							M				
755	755.1	19.0												755.1	19.0	WEATHERED ROCK
750			100/0.3									RS-1	Tan, Gray, and White (BIOTITE GNEISS)	20.5	753.6	CRYSTALLINE ROCK Black, Gray, and White (BIOTITE GNEISS)
745														744.4	29.7	Boring Terminated at Elevation 744.4 ft in Crystalline Rock (BIOTITE GNEISS)

NCDOT BORE DOUBLE B4982_GEO_BH_BRDG0038.GPJ NC_DOT.GDT 11/8/16

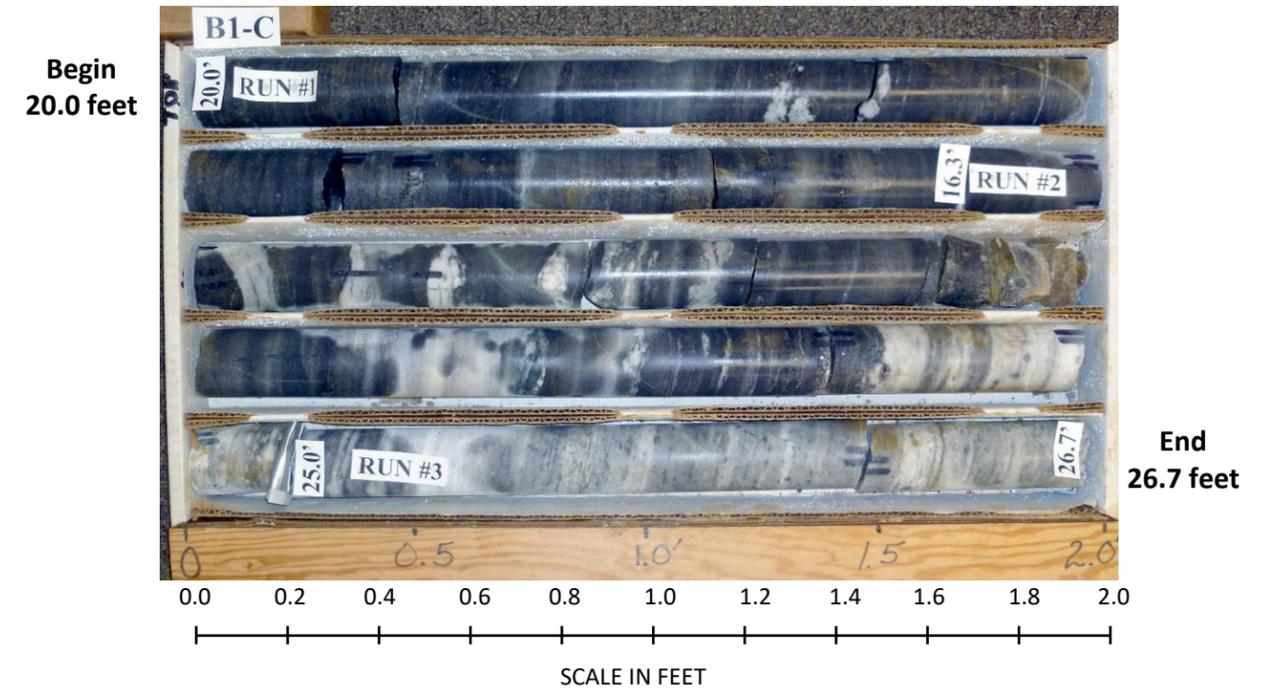
NCDOT CORE DOUBLE B4982_GEO_BH_BRDG0038.GPJ NC_DOT.GDT 11/8/16

WBS 40159.1.1		TIP B-4982		COUNTY IREDELL		GEOLOGIST Stickney, J. K.						
SITE DESCRIPTION Bridge No. 38 on US 21/NC 115 (Shelton Rd.) over Third Creek							GROUND WTR (ft)					
BORING NO. B1-A		STATION 20+45		OFFSET 28 ft LT		ALIGNMENT -L-						
COLLAR ELEV. 774.1 ft		TOTAL DEPTH 29.7 ft		NORTHING 733,797		EASTING 1,438,933						
DRILL RIG/HAMMER EFF./DATE HFC0072 CME-550X 85% 05/20/2016				DRILL METHOD NW Casing W/SPT & Core		HAMMER TYPE Automatic						
DRILLER Smith, C. L.		START DATE 08/18/16		COMP. DATE 08/18/16		SURFACE WATER DEPTH 0.5ft						
CORE SIZE NX			TOTAL RUN 9.2 ft									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	ROD (ft) %		REC. (ft) %	ROD (ft) %			
753.6	753.6	20.5	4.2	1:45/1.0 1:42/1.0 1:51/1.0 1:52/1.2	(4.2) 100%	(4.1) 98%		(9.0) 98%	(8.4) 91%		Begin Coring @ 20.5 ft	
750	749.4	24.7					RS-1				Black, Gray, and White, Fresh, Hard, BIOTITE GNEISS with Close to Wide Fracture Spacing RS-2=12.6-13.2, Qu=20.6 ksi, GSI=75-80	20.5
745	744.4	29.7	5.0	1:40/1.0 1:39/1.0 1:42/1.0 1:44/1.0 1:43/1.0	(4.8) 96%	(4.3) 86%					Boring Terminated at Elevation 744.4 ft in Crystalline Rock (BIOTITE GNEISS)	29.7

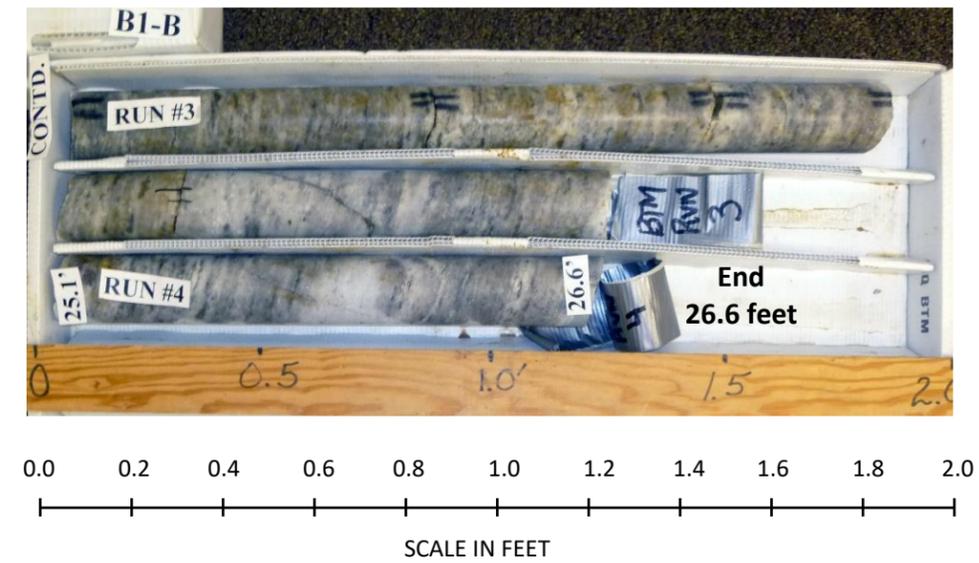
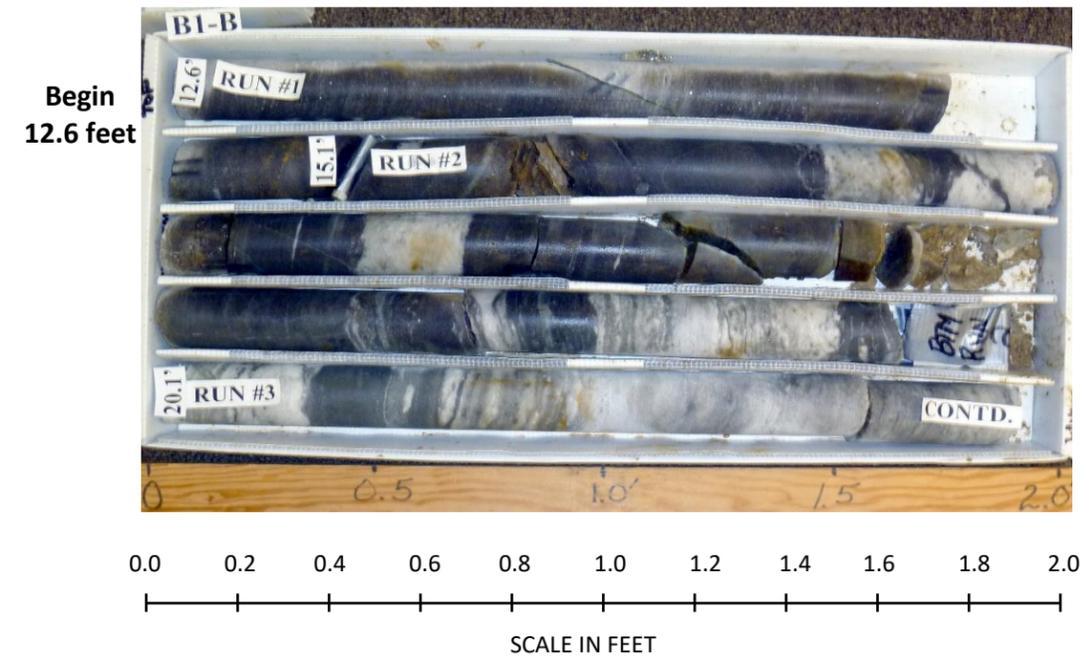
CORE PHOTOGRAPHS: Bridge No. 38 on US 21/NC 115 (Shelton Rd.) over Third Creek, B1-A 20+45, 28' LT



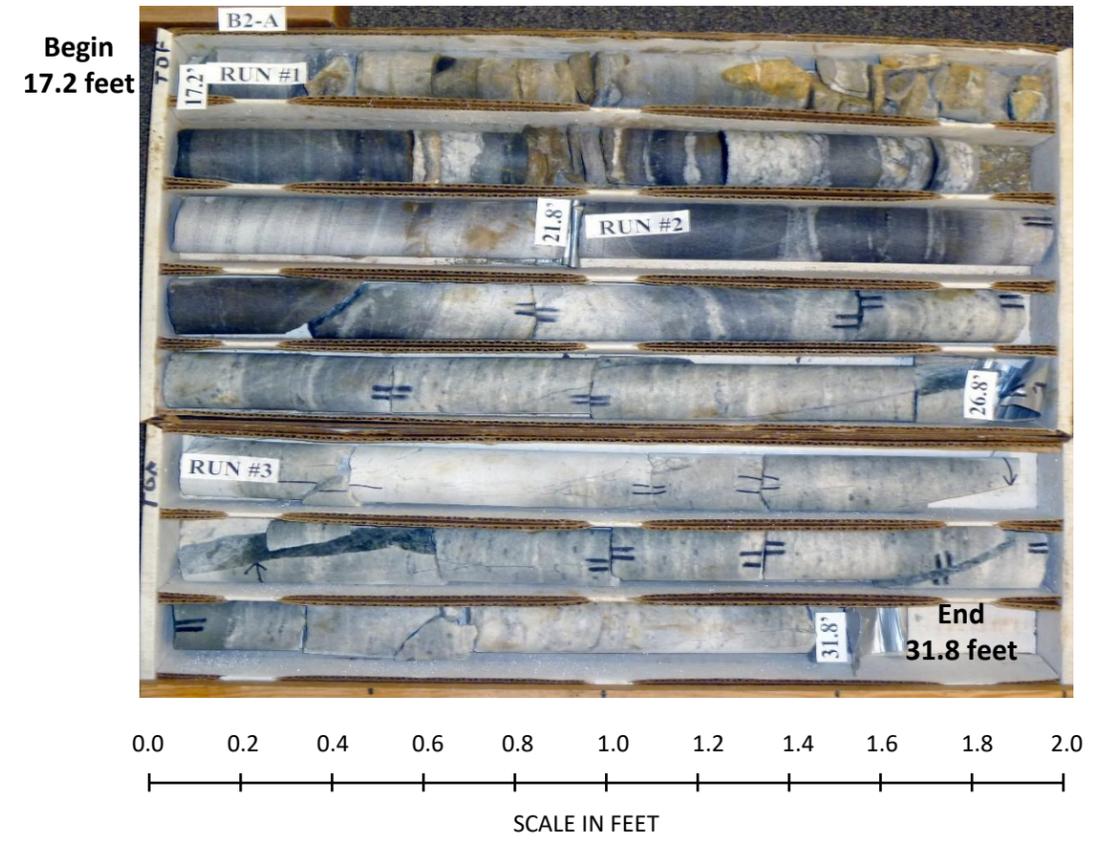
CORE PHOTOGRAPHS: Bridge No. 38 on US 21/NC 115 (Shelton Rd.) over Third Creek, B1-C 20+76, CL



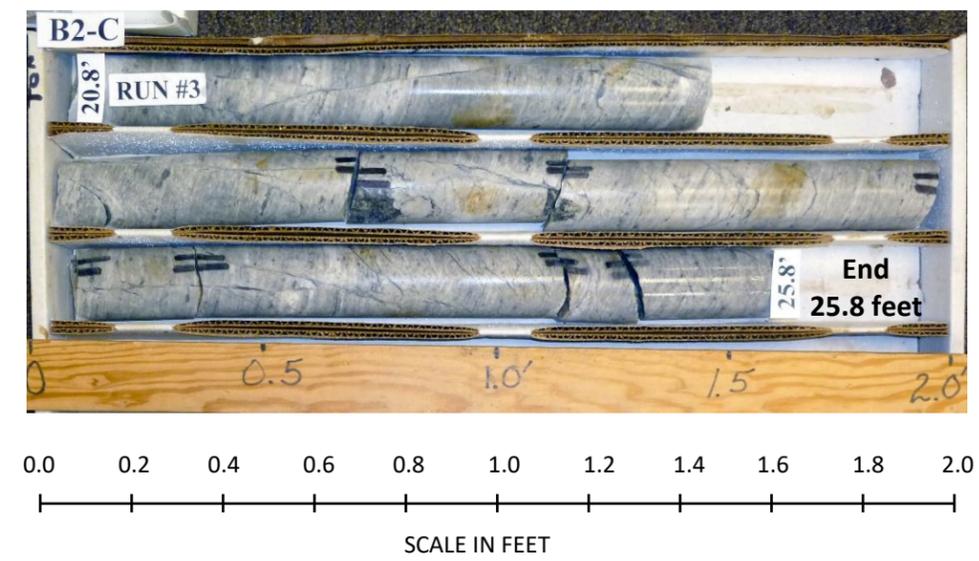
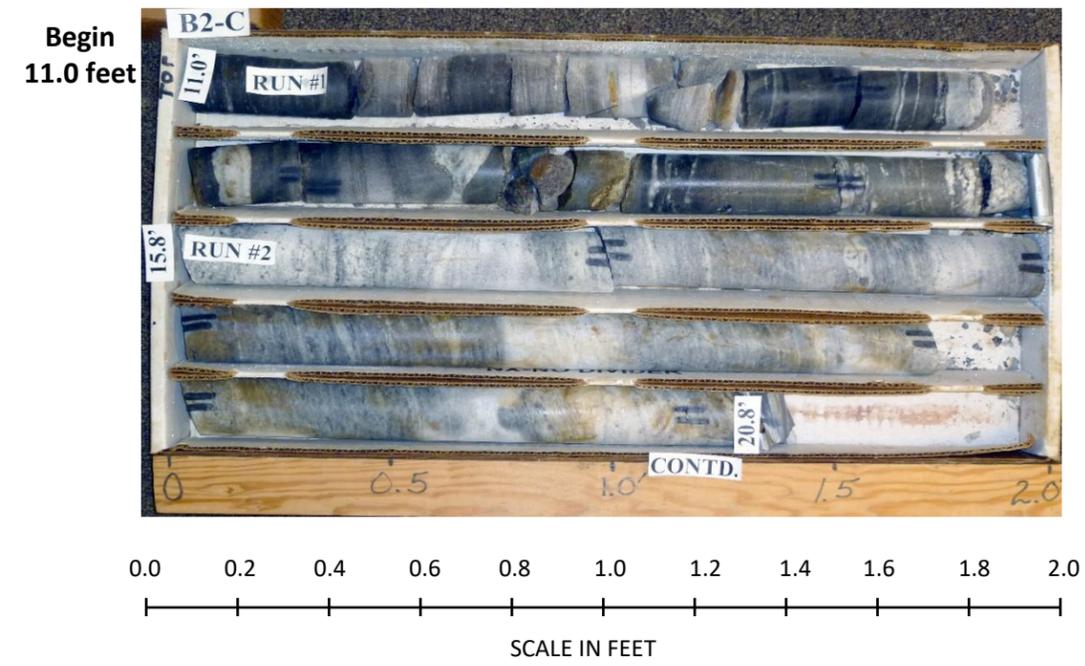
CORE PHOTOGRAPHS: Bridge No. 38 on US 21/NC 115 (Shelton Rd.) over Third Creek, B1-B 20+85, 11' RT



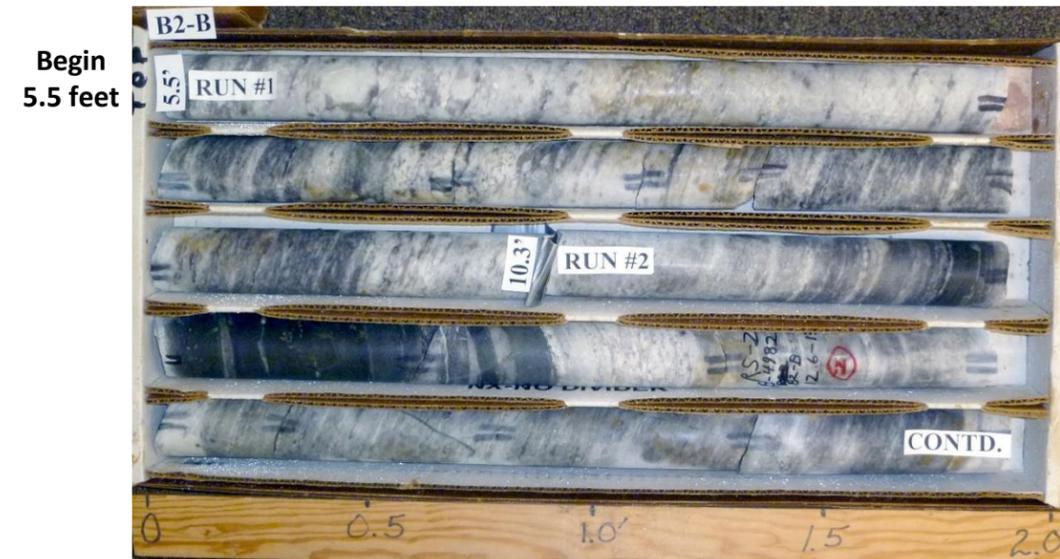
CORE PHOTOGRAPHS: Bridge No. 38 on US 21/NC 115 (Shelton Rd.) over Third Creek, B2-A 21+15, 29' LT



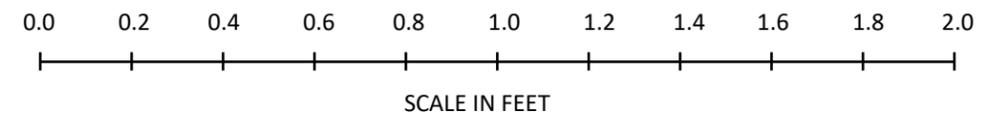
CORE PHOTOGRAPHS: Bridge No. 38 on US 21/NC 115 (Shelton Rd.) over Third Creek, B2-C 21+90, CL



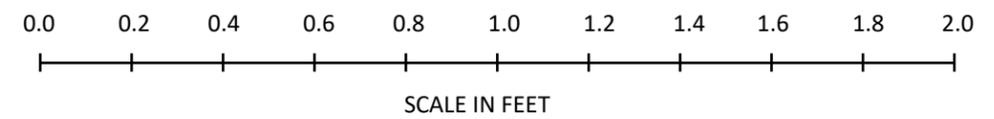
CORE PHOTOGRAPHS: Bridge No. 38 on US 21/NC 115 (Shelton Rd.) over Third Creek, B2-B 21+63, 23' RT



Begin
5.5 feet



End
20.3 feet



GEOTECHNICAL BORING REPORT BORE LOG

WBS 40159.1.1	TIP B-4982	COUNTY IREDELL	GEOLOGIST Stickney, J. K.
SITE DESCRIPTION Bridge No. 38 on US 21/NC 115 (Shelton Rd.) over Third Creek			GROUND WTR (ft)
BORING NO. EB2-A	STATION 21+84	OFFSET 30 ft LT	ALIGNMENT -L-
COLLAR ELEV. 794.4 ft	TOTAL DEPTH 20.1 ft	NORTHING 733,922	EASTING 1,438,994
DRILL RIG/HAMMER EFF./DATE HFC0072 CME-550X 85% 05/20/2016		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER Smith, C. L.	START DATE 08/22/16	COMP. DATE 08/22/16	SURFACE WATER DEPTH N/A

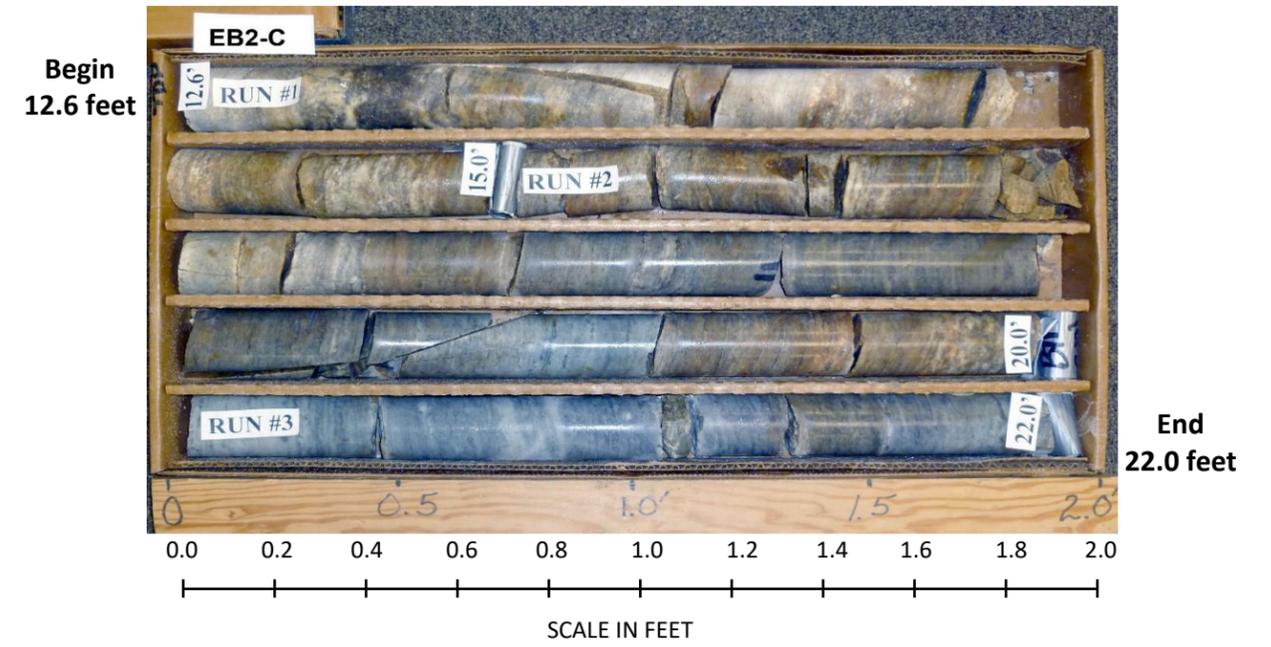
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					ELEV. (ft)
795														794.4	0.0
790	790.5	3.9	2	1	2										
785	785.5	8.9	2	1	2										
780	780.5	13.9	2	4	5										
775	775.5	18.9	25	75/0.4										775.9 775.0 774.3	18.5 19.4 20.1

NCDOT BORE DOUBLE B4982_GEO_BH_BRDG0038.GPJ NC_DOT_GDT 11/4/16

RESIDUAL
Brown and Gray, Clayey Sandy SILT (A-4)

WEATHERED ROCK
White (BIOTITE GNEISS)
Boring Terminated by Auger Refusal at
Elevation 774.3 ft on Crystalline Rock
(BIOTITE GNEISS)

CORE PHOTOGRAPHS: Bridge No. 38 on US 21/NC 115 (Shelton Rd.) over Third Creek, EB2-C 22+20, CL



SITE PHOTOGRAPHS



Photograph No. 1: Looking at Creek Flow Left to Right



Photograph No. 2: Looking at End Bent 1 towards End Bent 2

**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAY
MATERIALS & TESTS UNIT
PHYSICAL TESTING LABORATORY**

T. I. P. No. B-4982

REPORT ON SAMPLES OF ROCK COMPRESSION

Project 40159.1.1 **County** Iredell **Owner** J.E. Beverly
Date: Sampled 10/4/2016 **Received** 10/6/2016 **Reported** 10/12/2016
Sampled from Br # 38 over Thind Creek on US21 -NC115 **By** J.E. Beverly
Submitted by J.E. Beverly **Standard Specifications**
Tested By Michael Dubeau **Date Tested** 10/12/2016

TEST RESULTS

Proj. Sample No.		RS-1	RS-2			
Boring Sample No.		B1-A	B2-B			
Diameter	in	1.862	1.870			
Specimen Height	in	3.60	2.97			
Area	in ²	2.723	2.746			
H/D Ratio		1.93	1.59			
Weight	lbf	0.98	0.78			
Unit Weight	lbf/ft ³	172.8	165.2			
Ultimate	lbf	56400	48400			
Ultimate	ksi	20.700	17.610			
Ultimate Corrected	ksi	20.6	17.08			
Sec Mod @ 40%	Mpsi		4.82			
Station		20+45	21+63			
Offset		28 LT	23 RT			
Alignment						
Depth (ft)		23.00	12.60			
	to	23.60	13.20			

cc:

 Brian Hunter
 Physical Testing Engineer